



Are males better drivers?

Instructions:

Billy, one of the males in your class, has made an observation that the reaction times of males are faster than that of females. He went on to say "For driving a car quick reactions are important. Males will be better drivers than females because they have faster reaction times." Needless to say, this created some controversy in your class.

With a partner discuss what you think about the accuracy of Billy's claim?

Task One: Comparing the reaction times of males and females

You, Sammi and Jasmine, are unsure about the accuracy of Billy's claim, so you decide to investigate if males do have faster reaction times than females?

Data from the CensusAtSchool questionnaire could be used to investigate the reaction times of females and males.

Sammi suggests that a simple calculation of the mean reaction time for females and for males will give us the answer. Jasmine is not sure. She thinks that median should be used to measure the middle of a set of data. "They always use the median house price, don't they?"

Sammi also thinks it might be best to use functions in Excel. It will be easy to calculate both. Then we might be able to decide which is better.

- 1.** In a group, discuss how to investigate the claim and record the steps you need to carry out your investigation. It would be a good idea to test your own reaction and concentration times before you analyse the results so you understand what is being measured. In the 2006 survey you need data for questions 11, 12 and 32.

In the [2008 survey](#) you need data for questions 9, 10 and 31.

You can go to the CensusAtSchool web site and obtain a sample from the [random sampler](#). Or you can ask your teacher for a copy of a prepared sample from the web pages.

2. Carry out and record your investigation. Include any tables you used.

Table of reaction times (secs) showing + and - comparison between male and female results

		<i>Han d</i>				<i>Concentra tion</i>	
		<i>Dominan t (dom)</i>		<i>Non- domin ant (non)</i>		<i>activity (conc)</i>	
<i>Fema les (f)</i>	<i>mea n</i>	<i>0. 45</i>	<i>(0.0 1+)</i>	<i>0.50</i>	<i>(0. 5+)</i>	<i>43. 52</i>	<i>(0.9 6+)</i>
	<i>medi an</i>	<i>0. 39</i>	<i>(0.0 7+)</i>	<i>0.43</i>	<i>(0. 8+)</i>	<i>42. 50</i>	<i>(4.5 0+)</i>
<i>Males (m)</i>	<i>mea n</i>	<i>0. 44</i>	<i>(0.0 1-)</i>	<i>0.45</i>	<i>(0. 5-)</i>	<i>42. 66</i>	<i>(0.9 6-)</i>
	<i>medi an</i>	<i>0. 32</i>	<i>(0.0 7-)</i>	<i>0.35</i>	<i>(0. 8-)</i>	<i>38. 00</i>	<i>(4.5 0-)</i>

Teacher Note: this random sample is the first 100 from the random Sampler. Answers have been rounded to

Teacher Note: This table has headings for Male and Female and the results for the reaction times for both hands and for the concentration activity. For ease of comparison a column has been included to show the difference between the mean and median for both sexes. A percentage difference column would provide more detail for older students.

3. What can you conclude from your investigation?

It is clear that when looking at measures of centre males performed the tasks more quickly than the females. In particular, males performed much more quickly in the

concentration activity. This appeared more evident when the median score was used.

Task Two: Does one number tell you enough?

Jasmine is not happy with a conclusion that is based on just one number such as a mean or median. She says that this only gives a limited picture. The mean tells you nothing about the rest of the data. Sammi wants to know about all the data and suggests that a graph such as a histogram would give a more complete picture.

Jasmine has seen box and whisker plots and stem and leaf plots and thought they were good. They could be clearer than a histogram. She thinks that drawing parallel box plots or back to back stem and leaf plots a box plot of male's reaction times with female's reaction times will enable a better comparison to be made. The person who drew the box plot used the quartile function in MS Excel and then drew the box plot by hand. You can also draw a box plot in Excel if the Add-in has been added to the tools menu.

The Add-In for the 5 number summary, histogram and boxplot in Excel can be downloaded by:

1. Follow the link or copy and paste into your internet browser
<http://www.censusonline.net/downloads/StatisticsTools.xla>
2. Select Save
3. Choose a location then Save File as xla (not xls)
4. Open from location> Choose enable Macros
If you get a run time error just click End
5. Open new Excel document
6. Go to File>Options>Add-Ins>Analysis ToolPak>Go
7. Select Analysis Tool Pack > OK
8. Statistical Tools under Add-Ins and you'll see Statistical Tools in the Menu Commands

Please note this Add-In is from a site external to the ABS and therefore the ABS does not guarantee or accept any liability whatsoever arising from its use.

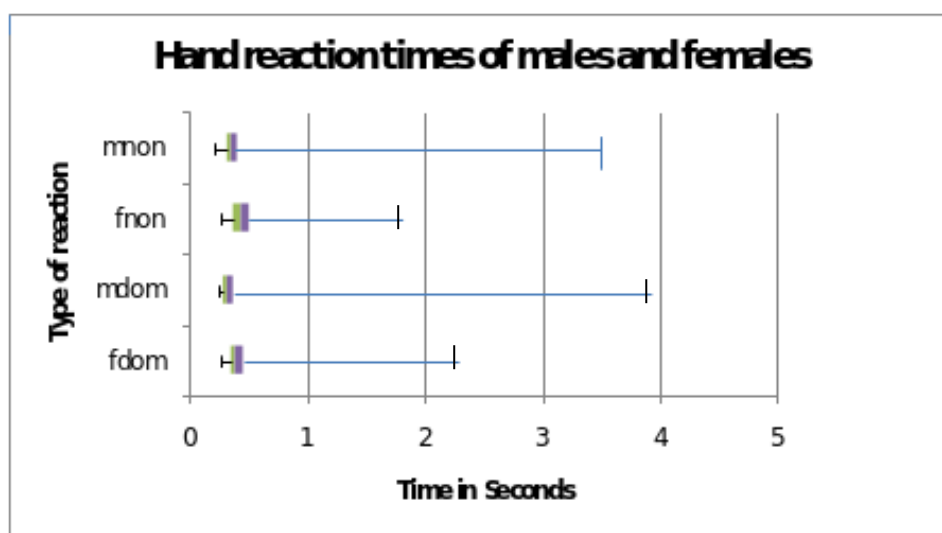
The Add-In does not allow for parallel box and whisker plots to be drawn.

- 4.** Decide on a way you can show 'all the data' and carry out the task. Record the results of your method.

Table of reaction times showing + and - comparison between males and females

<i>5 Figure Summary of reaction and</i>

<i>concentration times</i>						
	<i>fdo</i> <i>m</i>	<i>mdo</i> <i>m</i>	<i>fno</i> <i>n</i>	<i>mn</i> <i>on</i>	<i>f</i> <i>con</i> <i>c</i>	<i>m</i> <i>con</i> <i>c</i>
<i>minimum</i>	0.2 6	0.23 6	0.2 6	0.2 6	22	22
<i>q1</i>	0.3 4	0.28 7	0.3 7	0.3 1	36	30
<i>median</i>	0.3 9	0.32 25	0.4 25	0.3 5	42. 5	38
<i>q3</i>	0.4 5	0.37 5	0.5 5	0.4 5	49. 75	48
<i>max</i>	2.2 3	3.96 3	1.8 8	3.5 7	74	119

Box and Whisker Plot of Reaction Times

5. Comment on any additional information you have gained from examining 'all the data'.

We can make comments on the range when we have access to all the data. The most obvious observation is that range in the results for males was higher in all tasks. Both the maximum reaction and concentration time for males significantly exceeded that for females.

In this example, the scale on the box and whisker plot makes it difficult to read the data due to the inclusion of outliers. In particular, we can notice the maximum times in all data sets were significantly higher than the Q3 value and much more than double the median. It is usual to discard extreme values from the data as they could be due to sampling errors or extreme values that we don't want to influence our interpretation.

*The interquartile ranges are higher for females in the reaction times but higher for males in the concentration task. To summarise, while the mean and median scores for males were better than those for females, the slower (maximum) scores were for males in both tasks. This additional information **is** important in answering the question. It could be argued that while males have better reaction and concentration times as measured by the mean and median, the fact that the data indicates that the slowest males are significantly slower than the females balances this.*

Task Three: Can you say that driving ability is related to reaction time?

- 6.** What makes a good driver? You might like to do some research on this question to support your presentation.

Reaction times and the ability to concentrate are both important driving skills. However they are not the only skills needed. Other skills include good eyesight, knowledge of, and obeying, the road rules, not taking risks etc.

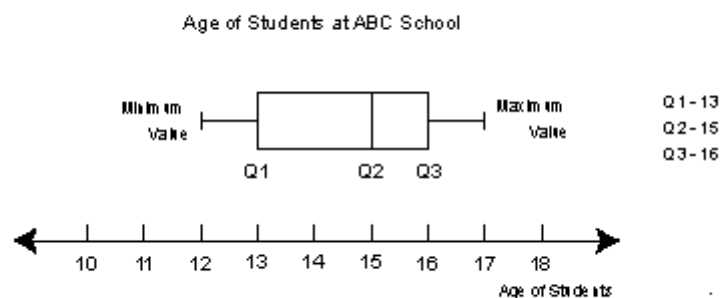
Extension

- 7.** Prepare a short presentation to your class addressing the claim that males make better drivers than females. Any conclusions you draw must be based on the CensusAtSchool data or other research you have conducted. Remember that people generally find graphs and diagrams easier to understand than tables of data.

Teacher Tips:

A Box Plot (often called a Box and Whisker Plot)

A box plot can be used to show interquartile range.

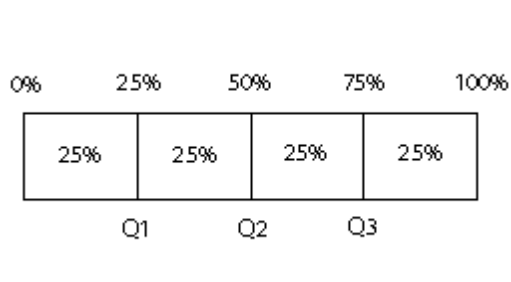


Box plots can be drawn horizontally or vertically.

Notice that a scale is drawn underneath. You can draw two or more box plots on the same scale. This is called a side by side box plot.

Interquartile Range

Interquartile range uses the median value so the data is arranged in ascending order.



Q1 is the reaction time that 25% of students are below.

Q2 is the median of the reaction times

Q3 is the reaction time for which 25% of students are above (75% are below).

I.e. in a sample of 100 students, when they are placed in ascending order:

Q1 is the value that is half way between the 25th and the 26th reaction time.

Q2 is the value that is half way between the 50th and the 51st reaction time.

Q3 is the value that is half way between the 75th and the 76th reaction time.

Interquartile Range = $Q3 - Q1$

50% of the reaction times will fall within the interquartile range.

The interquartile range could be used to compare a value to a sample. If the median reaction time for females falls between Q1 and Q3 for the males you could state that the reaction times are the same. You must clearly state that the decision is based on using the

interquartile range. Eg. "The reaction time for females is the same as for males because the median reaction time for females falls inside the interquartile range for males."

You can use the Excel function 'Quartile' to calculate the value of each quartile. The first quartile, Q1, of the cells from A1 to A101, is **=quartile(A2:A101,1)**.

The second quartile, Q2, is calculated with the function **=quartile(A2:A101,2)**

Draw a table in which to enter the quartiles for females and males. Use the spreadsheet function to calculate Q1, Q2 and Q3 for females and for males.